

# The Future of SF<sub>6</sub> for Electric Utilities and the Magnesium Industry

Scott Bartos and Jerome Blackman

2<sup>nd</sup> International Conference on

SF<sub>6</sub> and the Environment

San Diego, CA November 21, 2002

# Organization

- High GWP Chemicals
- Environmental Impacts
- U.S. Climate Policy
- EPA's Voluntary Partnerships
- Industry Emissions
- New Reduction Opportunities

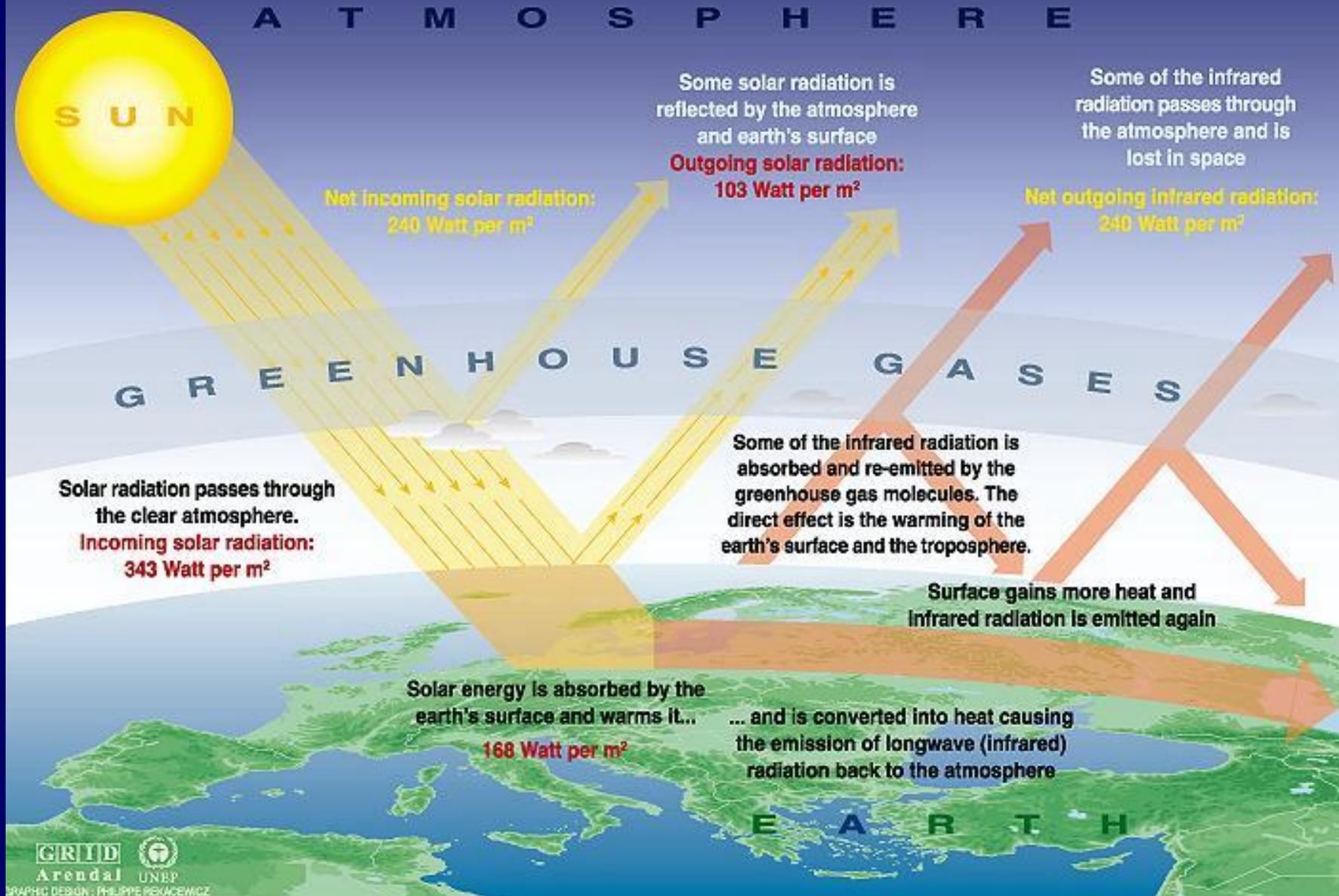


# Heat Trapping Pollutants

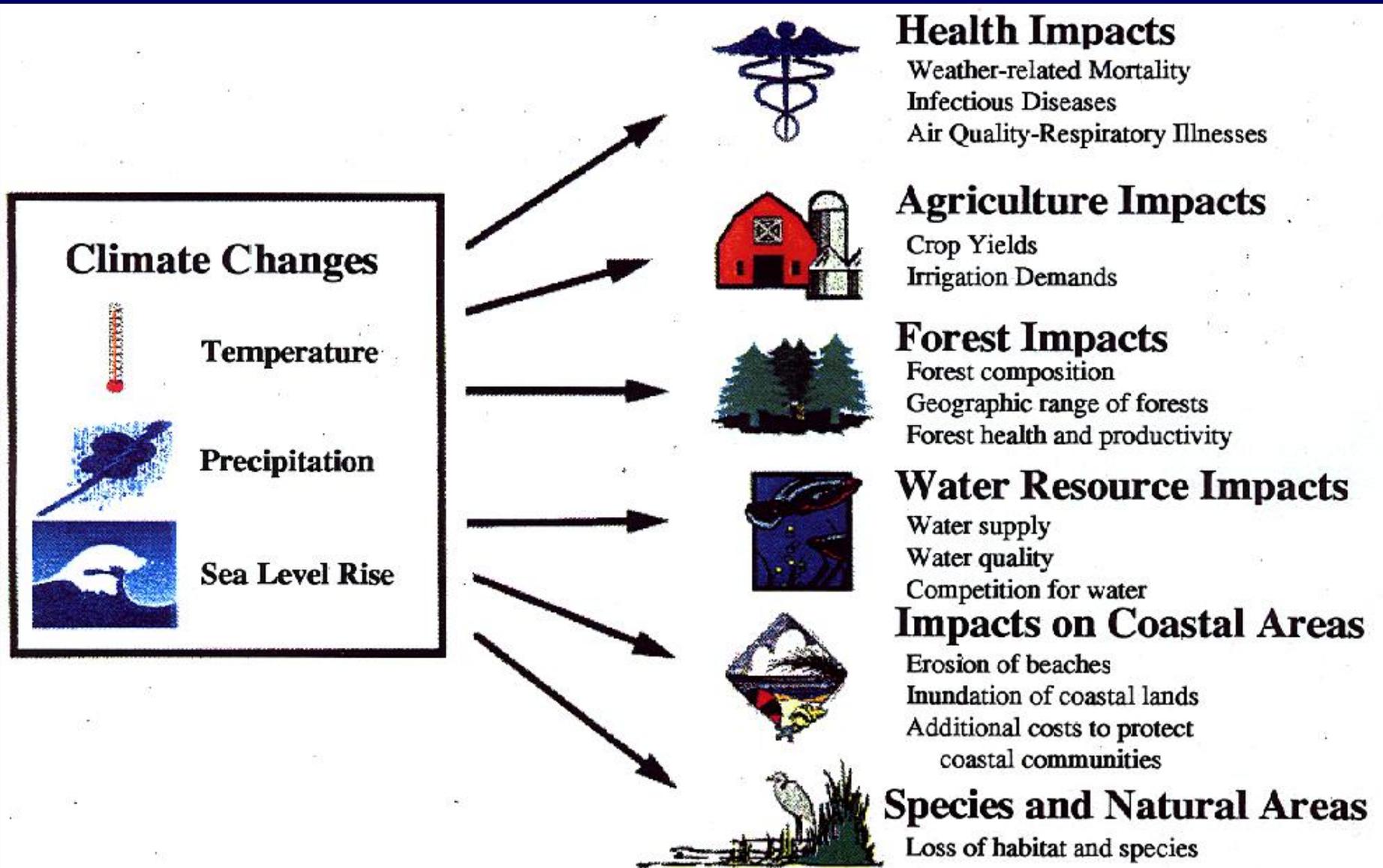
- Carbon dioxide,  $\text{CO}_2$
- Methane,  $\text{CH}_4$
- Nitrous Oxides,  $\text{NO}_x$
- **Hydrofluorocarbons, HFCs**
- **Perfluorocarbons, PFCs**
- **Sulfur Hexafluoride,  $\text{SF}_6$**



# The Greenhouse effect



# Potential Impacts



# Why Worry About SF<sub>6</sub>?

Compound	Atmospheric Lifetime (Years)	Global Warming Potential (100-year time horizon)*
CO <sub>2</sub>	200	1
CH <sub>4</sub>	12	21
HFC-134a	14.6	1,300
CF <sub>4</sub>	50,000	6,500
SF <sub>6</sub>	3,200	<b>23,900</b>

\*IPCC 1995



# U.S. Climate Change Policy I

- Reduce GHG Intensity by 18% in 2012
  - 2002 = 183 metric tons GHG/\$1 million GDP
  - 2012 = 151 metric tons GHG/\$1 million GDP
- Increased funding
  - FY '03 request \$4.5 billion
    - \$700 million increase
  - Basic scientific research and technology development



# U.S. Climate Change Policy II

- Improve emission reduction registry
  - Improve DOE's 1605(b)
    - | accuracy
    - | reliability
    - | verifiability
- Protect and provide credits for reductions
- Additional actions as needed in 2012
- Bilateral agreements



# Climate Leaders

- “Umbrella” climate protection program
- Develop long-term comprehensive climate protection strategies
- Set corporate-wide GHG reduction goal
- Track reductions through an EPA-approved GHG inventory protocol



# Charter Climate Leaders (Partial List)

## ■ IBM

- PFCs by 10% and power by 4% by 2005

## ■ Miller Brewing

- 18% per barrel by 2006

## ■ Bethlehem Steel

- 12% per ton of steel by 2010

## ■ ST Microelectronics



# Cornerstone of U.S. Policy

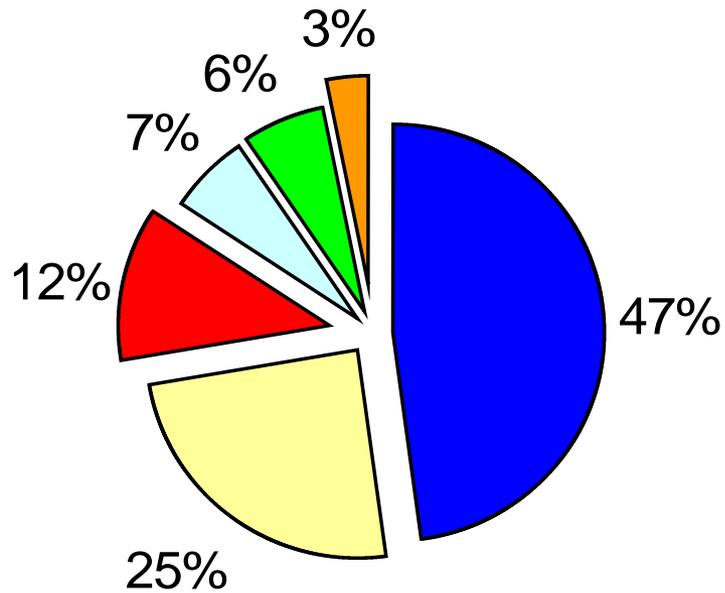
- “Already, agreements with the semiconductor and aluminum industries and others have dramatically cut emissions of . . . the most potent greenhouse gases.”
- President George W. Bush

# High GWP Industrial Partnerships

- 2% of U.S. total GHG in 2000
  - ODS Substitutes
  - Aluminum Production (PFCs)
  - HCFC-22 Production (HFC-23)
  - Semiconductors (PFCs, HFCs, SF<sub>6</sub>)
  - Electric Power Transmission (SF<sub>6</sub>)
  - Magnesium Production and Casting (SF<sub>6</sub>)



## 2000 U.S. High GWP Emissions (121.3 MMTCO<sub>2</sub> Eq.)



- ODS Substitutes
- HCFC-22 Production
- Electric Power Systems
- Aluminum
- Semiconductors
- Magnesium

# Growing Industry Participation

## ■ Magnesium Industry

- 17 U.S. producers and casting companies
- >80% of U.S. industry emissions

## ■ Electric Power Systems

- 65 Utilities
- >35% of U.S. transmission grid



# Pollution Prevention (P<sup>2</sup>) Approach

- Process Optimizations
  - Gas handling
  - Leak detection
- Alternative chemicals or designs
- Capture/Recycle
- Abatement



# Memoranda of Understanding

- EPA's responsibilities:
  - Develop tracking and reporting protocols
  - Evaluate reduction technologies
    - | Global warming effects, toxicity
  - Facilitate information sharing
    - | Case studies
    - | Host technical conferences
  - Recognize industry leaders
    - | Climate Protection Award



# Memoranda of Understanding

- Partner company responsibilities:
  - Commit to reduce emissions
  - Document baseline and annual emissions
  - Explore long-term emissions control options
  - Share information on successful (and not so successful) strategies



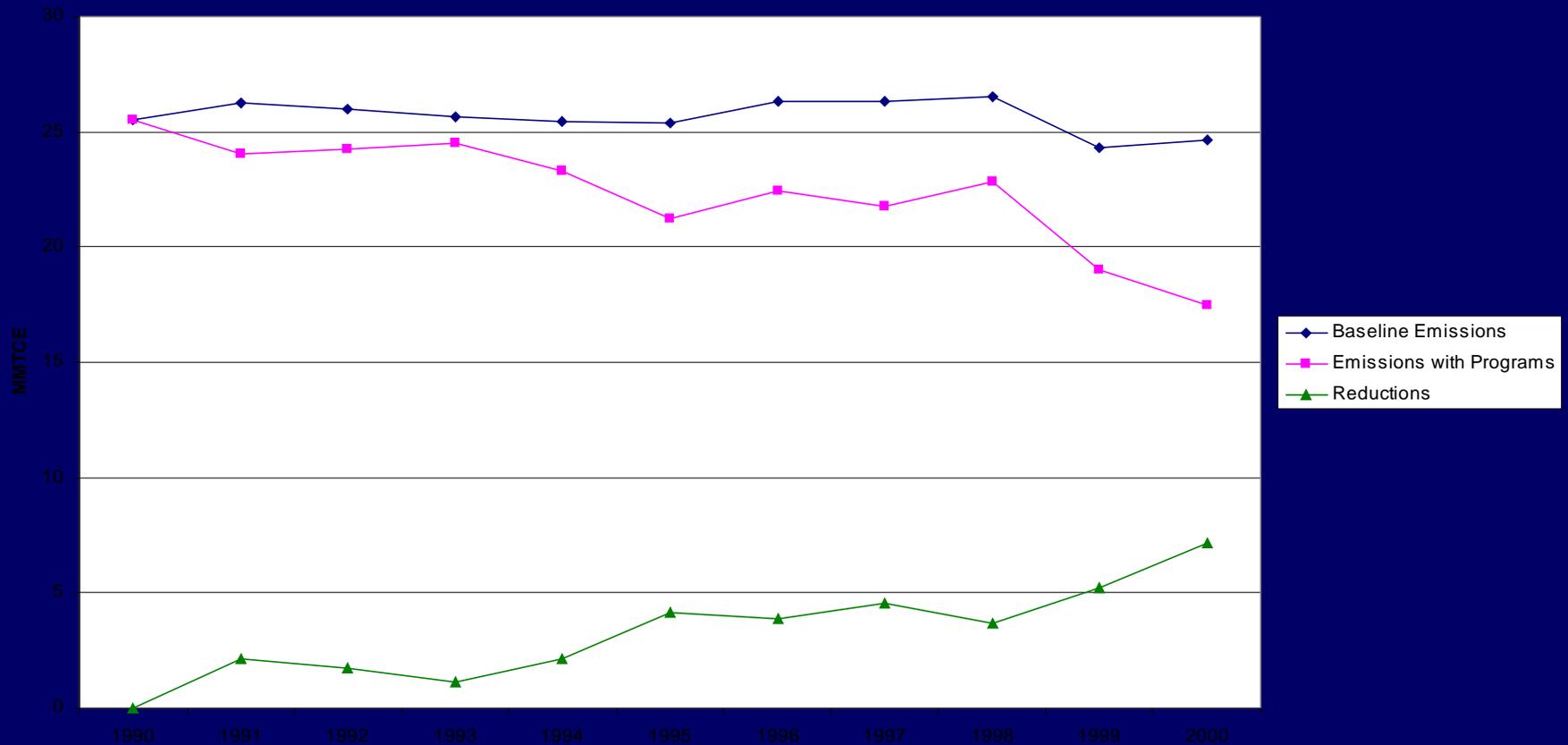
# Power of Voluntary Partnerships

- Flexible
- Information-based
  - Can not manage what is not measured
- Cooperative research initiatives
- Explore new approaches to P<sup>2</sup>
- Involve various industry stakeholders
- Non-regulatory



# Results: 1990 - 2000

High-GWP Voluntary Program Emission Reductions 1990-2000



# Reduction Opportunities

## ■ Electric Power Systems

- Solid State Current Limiter Research
- Voluntary Agreements with Utilities

## ■ Magnesium

- Advanced SF<sub>6</sub> leak detection
- Equipment designs
- Alternative protective cover gases



# Pollution: It's a Small World



Earth at Night  
More information available at:  
<http://satwpp.gsfc.nasa.gov/pod/ep001127.html>

